

City of  
Los Angeles  
Urban  
Water  
Management  
Plan  
Executive  
Summary



Los Angeles  
Department of  
Water and  
Power

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**T**he Los Angeles Board of Water and Power Commissioners is pleased to present the Executive Summary of the Urban Water Management Plan for the City of Los Angeles (Plan) in accordance with the California Urban Water Management Planning Act of 1983.

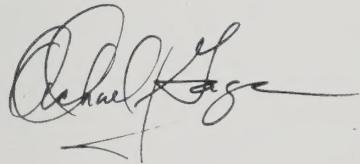
In adopting this Plan, the Los Angeles Department of Water and Power commits to pursue those water conservation and management programs which are feasible and cost-effective for the City of Los Angeles (City).

The Department gratefully acknowledges the enthusiastic public participation received during the development of this Plan. We will continue to seek public input on the City's water conservation program by conducting annual public workshops which will focus on the continued effectiveness of the Plan and suggestions for its improvement.

The Department has prepared and adopted this Plan not only to comply with the law but to assist in the development of an understanding of water management throughout California.

It is our wish that the avenues of communication opened during the annual workshops and the preparation of this Plan will lead to a successful resolution of city, regional and statewide water supply problems.

Sincerely,



Mike Gage  
President, Board of Water and  
Power Commissioners

**L**os Angeles is the nation's second largest city. It encompasses 464 square-miles and has a population of more than 3.4 million residents. Since the beginning of the municipal water system in 1902, many policies and programs have been adopted to encourage efficient use of the City's water resources for today and into the future.

This executive summary presents the major components of the Urban Water Management Plan for the City of Los Angeles. The Plan, prepared by the Los Angeles Department of Water and Power (DWP), describes the City's efforts to promote efficient water use and to efficiently manage its water resources.

Public input from private citizens, government officials, water conservation experts and special interest groups was received for the first Plan, prepared in 1985. Several of the conservation and water management measures, which have been incorporated into the initial Plan, resulted from public input.

Annual workshops have been held since the 1985 Plan was adopted by the DWP Board. The 1990 annual workshops specifically sought input for the 1990 Plan. Two public meetings were held in the fall of 1990 to receive comments on the draft Plan.

Los Angeles will continue its conservation programs such as low-flow shower head distribution, ultra-low-flush toilet rebates, educational services, and water surveys to help decrease the City's use of water, thereby slowing the overall increase in water demand. Alternative supplies such as water reclamation will continue to be developed, and the City will continue to practice efficient management of its underground basins.

However, conservation and alternative supplies alone will not eliminate the water supply shortages facing Southern California. Existing supplies will need to be protected from pollution, and additional water supplies must be developed to meet the needs of Southern California's growing population.

The Plan was developed with the goal of increasing the efficiency of water usage. The Plan is summarized as follows:

- Pursue all economically efficient water conservation measures at the local and statewide level.
- Develop reliable and cost-effective sources of alternative water supplies, including water reclamation and exchanges and transfers.
- Protect existing water supplies from contamination, and clean up groundwater supplies so those resources can be more fully utilized.
- Work to improve water quality and reliability of supply from the State Water Project.

Future programs and policies of the Los Angeles Department of Water and Power will be consistent with this Plan.



# A Plan for Water Conservation in Los Angeles

## WATER USE IN LOS ANGELES

### Past

In 1900, the population of Los Angeles was 100,000 and water use amounted to 30,000 acre-feet\* per year (AF/yr.). By 1920, the population had grown to 600,000, the San Fernando Valley had become an agricultural center using an average of 80,000 AF/yr. of water, and water use had climbed to an average of 160,000 AF/yr.

Population growth continued at a moderate rate until the end of World War II, when the population began to increase rapidly and suburban development began to displace agriculture in the

San Fernando Valley. By 1970, the population had climbed to 2.8 million, water use by agriculture had fallen to an average of 5,000 AF/yr., and the City's total water use had grown to an average annual demand of 570,000 AF/yr.

### Present

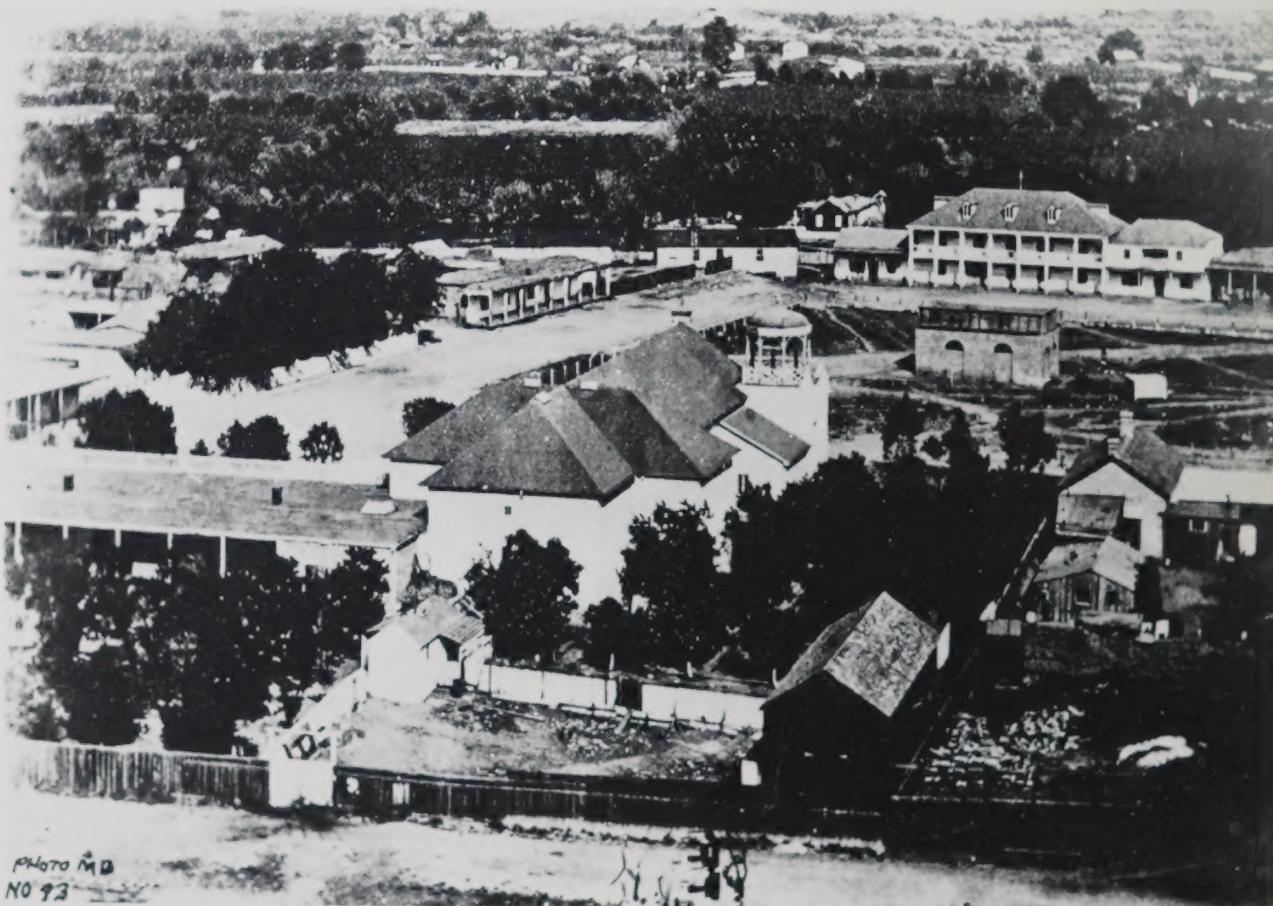
Today, the population of Los Angeles is over 3.4 million and the city's average annual total water use is approximately 695,000 AF/yr. Per capita water use is the amount of water used daily by each person. Average water use in Los Angeles is approximately 179

gallons per capita per day (GPCD) for all uses combined, and averages 115 GPCD by residential customers. Per capita water use may actually be 10-15 percent lower due to the presence of a large uncounted population in Los Angeles. Approximately 34 percent of the City's total water use is used for irrigation of lawns and gardens, parks, golf courses, and other greenbelts.

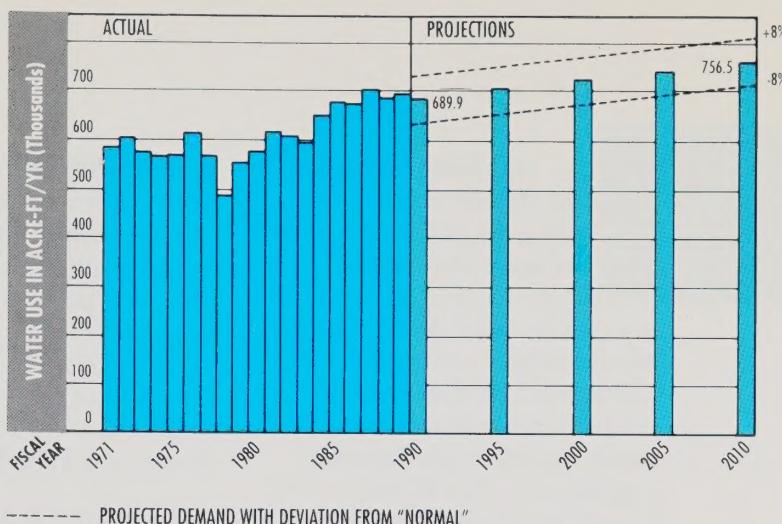
### Future

The population of Los Angeles is projected to grow to approximately 3.87 million by 2010. Normal water use is

Water transformed the once-tiny pueblo of Los Angeles into the major metropolis it is today.



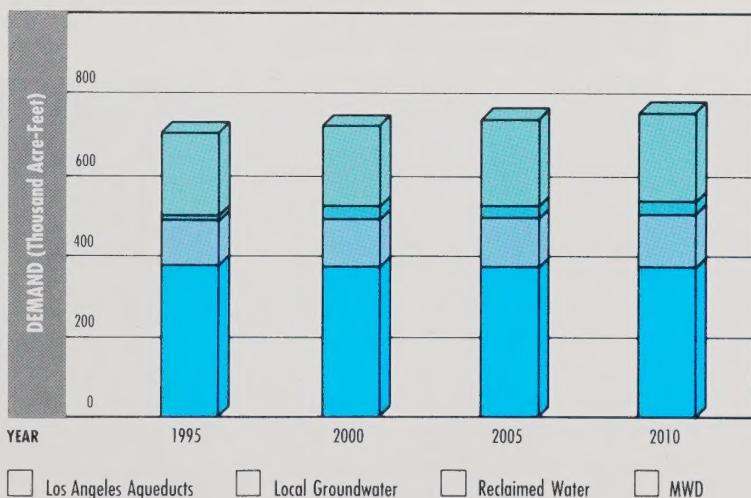
## ACTUAL AND PROJECTED WATER USE



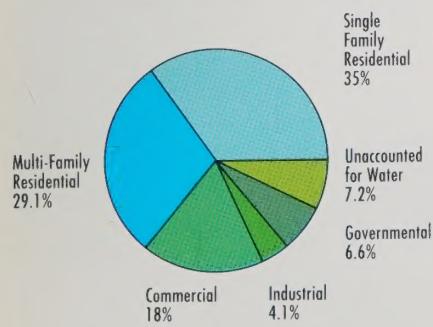
projected to increase from 689,600 AF/yr. in 1990 to 756,500 AF/yr. in 2010. Average yearly per capita water use is expected to decline from its peak of 183 GPCD in 1975, to 174 GPCD in 2010. This decline in per capita use will result from water conservation and from the effects of increasing population density and will occur despite the effects of commercial and industrial growth and other factors that will tend to increase per capita use.

\*Acre-foot — One acre-foot equals 325,851 gallons of water, enough water to supply a family of five for a year. An acre-foot is approximately equivalent to filling a football field with water, one foot deep.

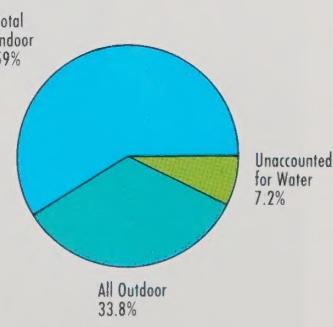
## FUTURE TOTAL DEMAND AND SOURCE OF SUPPLY



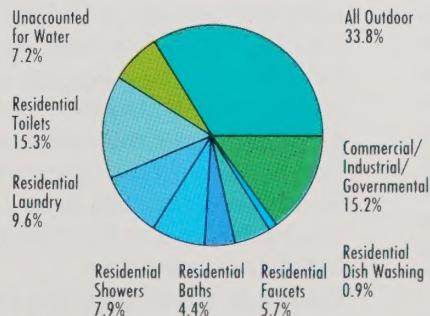
## TOTAL CONSUMPTION FISCAL YEAR 1989-90



PERCENTAGE BREAKDOWN



INDOOR/OUTDOOR BREAKDOWN



END USE BREAKDOWN

**T**he City of Los Angeles obtains its water supply from the Los Angeles Aqueduct, local wells, water purchases from the Metropolitan Water District of Southern California (MWD), and by reclaiming wastewater for reuse, generally for certain irrigation applications. Groundwater recharge with reclaimed water is expected to be a significant portion of the City's water supply after the year 2000. Today's water supply is adequate to meet demand but must be increased to reliably serve a population that is still growing.

The long-term delivery capacity of the Los Angeles Aqueduct is uncertain and the average yield of local wells is fixed and cannot be increased in the future. Future increases in water demand must therefore be met through increased utilization of reclaimed water and increased purchases of water from MWD.

Short-term use of reclaimed water for irrigation and industrial purposes will increase to between 6,900 acre-feet per year (AF/yr.) and 10,500 AF/yr. over the next five years. Also, the ability of MWD to meet the growing water demands of Los Angeles and the rest of Southern California is in doubt due to a reduction in MWD's dependable Colorado River supplies and the present inability of the State Water Project (SWP) to meet its contractual obliga-

tions to MWD and the other SWP contractors.

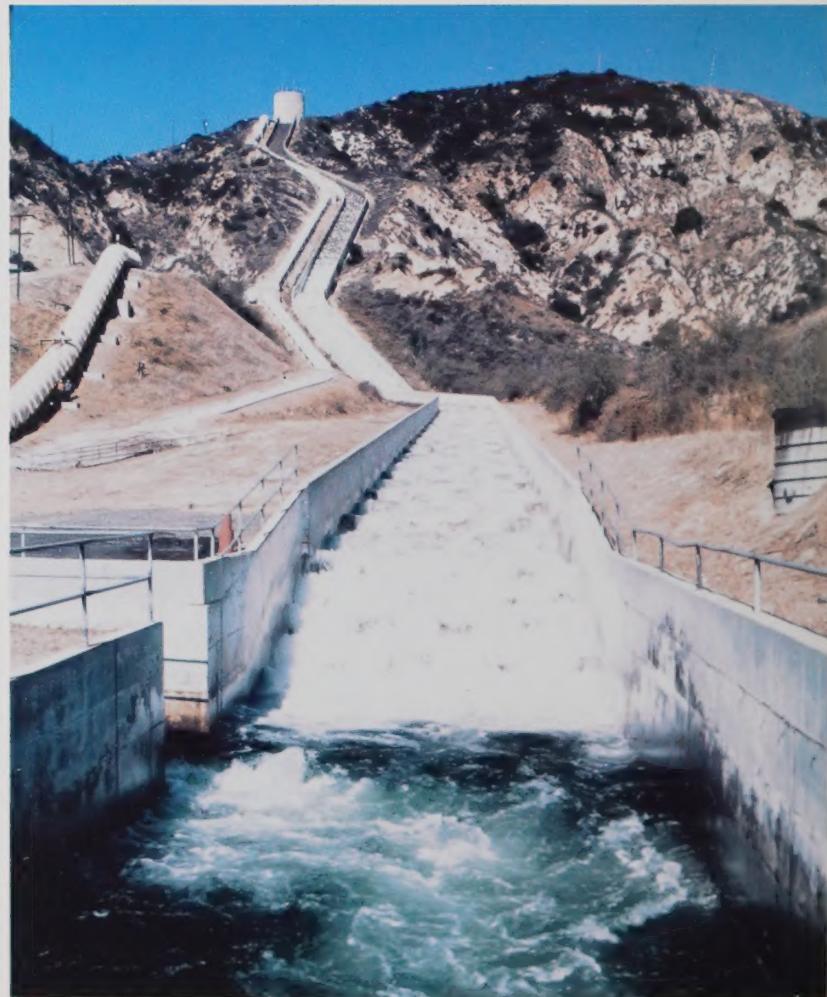
The current marginal cost of conventional water supplies available to the City from MWD is currently \$230 per acre-foot. This cost is expected to increase to approximately \$500 per acre-foot by the year 2010.

#### Los Angeles Aqueducts

Los Angeles completed the First Los Angeles Aqueduct in 1913 to import water from the eastern slope of the Sierra Nevada, some

250 miles to the north. In 1970, the City completed a second aqueduct, essentially paralleling the first, which increased the capacity of the aqueduct system to an average of 450,000 AF/yr. However, the average yield of the Los Angeles Aqueducts is assumed to be reduced for purposes of the Plan from the 450,000 AF/yr. (amount available for the past 20 years) to 380,000 AF/yr. as a result of continuing challenges to DWP's water rights in Mono Basin

Two large aqueducts transport water to Los Angeles from the Owens Valley and Mono Basin.



and Owens Valley. Los Angeles is currently defending these supplies against legal, legislative and environmental challenges.

Although actual water deliveries tend to increase in wet years and decrease in dry years, the long-term average water delivery is fixed and cannot be increased in the future.

#### Local Sources

The City has rights to an average of 112,000 AF/yr. of surface water and groundwater in the Los Angeles area. The largest of these sources is the San Fernando Groundwater Basin, which underlies much of the San Fernando Valley. The City utilizes this basin as a storage reservoir in which wet year surplus water can be stored, an operation known as conjunctive use. Stored water is then available for use during dry years, when as much as 150,000 AF/yr. can be reliably withdrawn from the basin. Currently, the long-term average amount of water that the City can extract from the groundwater basins cannot exceed 112,000 AF/yr. It is planned to increase the long-term average yield by recharging the San Fernando Groundwater basin with reclaimed water.

#### Metropolitan Water District

The City supplements its local and imported supplies by purchasing water from the Metropolitan Water District of Southern

California (MWD), a state-chartered association of Southern California water agencies. MWD imports water to the area from the Colorado River via the Colorado River Aqueduct, and from Northern California via the State Water Project's California Aqueduct.

The amount of water that Los Angeles purchases from MWD varies from year to year depending on demand in the City and on the quantity of water available from the City's own sources.

#### Reclaimed Water

Water reclamation is the reuse of treated municipal wastewater for irrigation and other nonpotable uses. The City presently uses about 1,000 AF/yr. of reclaimed water to irrigate golf courses, parks and other greenbelts.

Additional projects under development will increase this use to approximately 10,500 AF/yr. by 1995, 30,000 AF/yr. by 2000, and 32,800 AF/yr. in 2010. In addition, 20,000 AF/yr. is anticipated to be used for groundwater recharge by the year 2010.



Between fiscal years 1970-71 and 1989-90, Los Angeles' average yearly MWD water purchases were 78,550 AF/yr. — approximately 13 percent of L.A.'s total water supply. However, in fiscal year 1989-90 alone, Los Angeles purchased approximately 385,000 acre-feet, amounting to 55 percent of the City's total water supply for 1989-90.

Ultimately, up to 45,000 AF/yr. may be used for groundwater recharge. Another 35,000 AF/yr. will be used for recreational uses by the year 1995.

**The Colorado River Aqueduct carries water across the Mojave Desert to Los Angeles and other cities.**

Los Angeles has encouraged water conservation since the founding of the municipal water system in 1902.

During the ensuing decades, the City has implemented many additional conservation-oriented policies and programs.

## Metering

Metering is an essential element of a comprehensive water conservation program. Los Angeles began a policy of metering every customer in 1902 — a policy that continues today. Studies show that the per-person water use in cities with meters is substantially below that in unmetered cities.

## Historical Pricing

From 1977 to November 1985, DWP charged its customers based on a uniform rate structure in which the unit cost of water neither declines nor increases with use, thus eliminating the use of volume discounts. The uniform rate structure replaced a declining block structure, under which the unit price of water fell as use increased. DWP is studying replacing the uniform commodity rate structure with an Increasing Block Rate Structure in order to reduce water consumption.

The DWP's intensive advertising campaign provides tips on ways to save water.

## Seasonal Pricing

To further encourage water conservation, the Los Angeles City Council adopted DWP's proposal for a seasonal pricing structure in November 1985 which sets summer water rates higher than winter rates. Originally, the price differential was 12.6 percent higher in summer. The current price differential of 25 percent went into effect in April 1990. The higher summer rates serve to lower peak summertime and overall demands and reflect to customers the higher costs of extra system capacity required to accommodate peak summer demands.

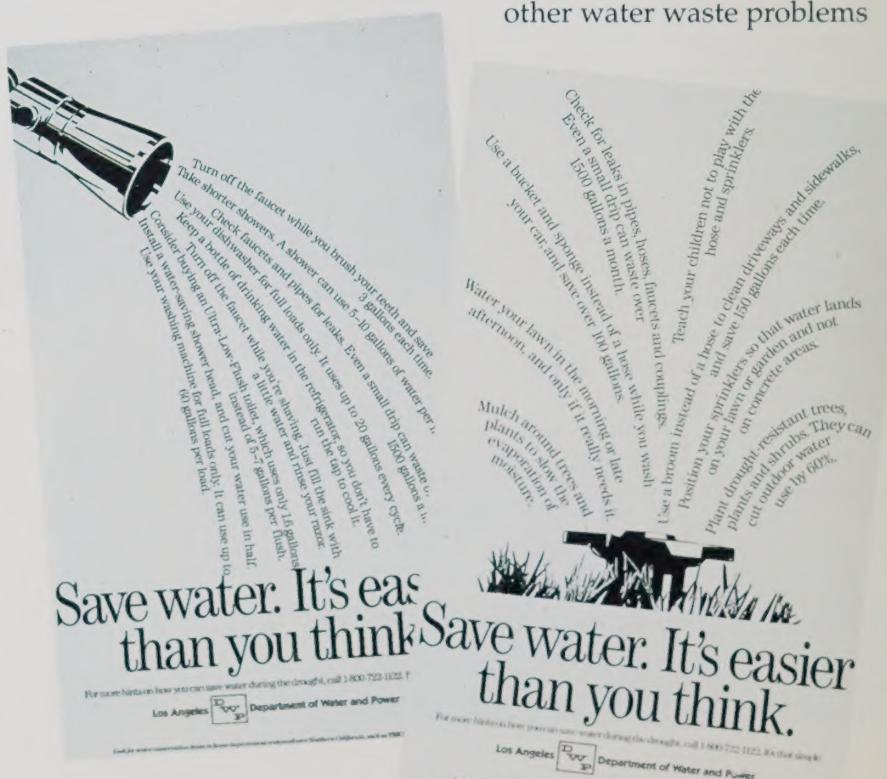
## Sewer Charges

The DWP also collects sewer charges for the Los Angeles Department of Public Works, which are

billed at a uniform commodity rate. The sewer service charges were implemented in 1972 for commercial/industrial/governmental customers, and in 1978 for residential customers. Prior to the implementation of these charges, sewer service revenue was collected through property taxes. This implementation of the charges as a commodity charge based on water use increases the incentive for customers to use water efficiently.

## Billing

Water bills from DWP include a listing of the water customer's water consumption for the same period the previous year, allowing customers to make quick comparisons to present use. Substantially higher present use may indicate a leak or other water waste problems.





**The Residential Home Survey team provides customers with free evaluations and recommendations on efficient water and energy usage inside and outside the home.**

on the customer's property. Beginning in the summer of 1990, DWP bills also indicate each individual customer's conservation goal which is the amount of water used during the same period in 1986 minus 10 percent.

#### **Public Information Programs**

The Department of Water and Power distributes information to the public on water conservation through a variety of programs, including brochures, advertising, bill inserts, exhibits, films, a toll-free conservation telephone line, a community involvement program, special programs like the annual obser-

vance of Water Awareness Month in May, and the establishment of the "Drought Busters" water watch efficiency program.

#### **School Education Programs**

Los Angeles has developed a comprehensive school education program to promote water awareness and conservation. Materials specific to different age groups, including workbooks, films, videos and plays, are distributed to local schools at no charge. Training for teachers in the use of materials is also provided. Additionally, the DWP sponsors tours of its facilities for students and instructors.

#### **Residential Programs**

To help customers comply with the Water Conservation Ordinance to Reduce Sewer Flows, the DWP has distributed low-flow shower heads and toilet tank displacement bags to all residential customers requesting them. Since July 1988, approximately 1.4 million low-flow shower heads have been distributed. From 1977 to 1988, the DWP distributed approximately 2 million water-saving retrofit kits to residential customers.

DWP has also implemented a Residential Home Survey Program to promote efficient energy and water use both inside and outside the home. On request, a conservation representative visits the customers' homes, evaluates water needs, and provides written recommendations to help customers reduce water usage. A residential loan program provides residential customers with low-interest loans for many water-saving devices, equipment, and services. Plans to improve the program include promoting water audits through apartment owner organizations, distributing more information on the availability of retrofit kits, and by giving additional water conservation training to all auditors.

The DWP's Ultra-Low-Flush (ULF) Toilet Rebate Program offers residents a rebate of \$100 for each conventional toilet replaced by a

Conservation gardens can be beautiful as well as water-efficient.

city-approved ULF toilet. The DWP has paid more than \$3 million in rebates. L.A. City law has required water efficient plumbing fixtures in new construction since 1988.

Beginning January 1, 1992, state law will require toilets that flush a maximum of 1.6 gallons of water in all new residential and commercial buildings constructed in the state.

#### **Programs for Business and Industry**

DWP has implemented conservation programs aimed specifically at its commercial, industrial and governmental customers. An awards program, begun in 1978, provides recognition to those customers who have achieved outstanding efforts in water conservation.

With DWP assistance, the Los Angeles Unified School District has implemented a program that rewards individual schools for outstanding efforts in conserving water, gas and electricity. Schools are reimbursed by the school district with a portion of money saved on utility bills, which can then be used for school improvement projects. Other programs include a water and energy conservation audit program, a water meter loan program, brochures, a Business and Industry Symposium, and the recent development of Water Conservation Advisory Committees.

#### **Landscape Programs**

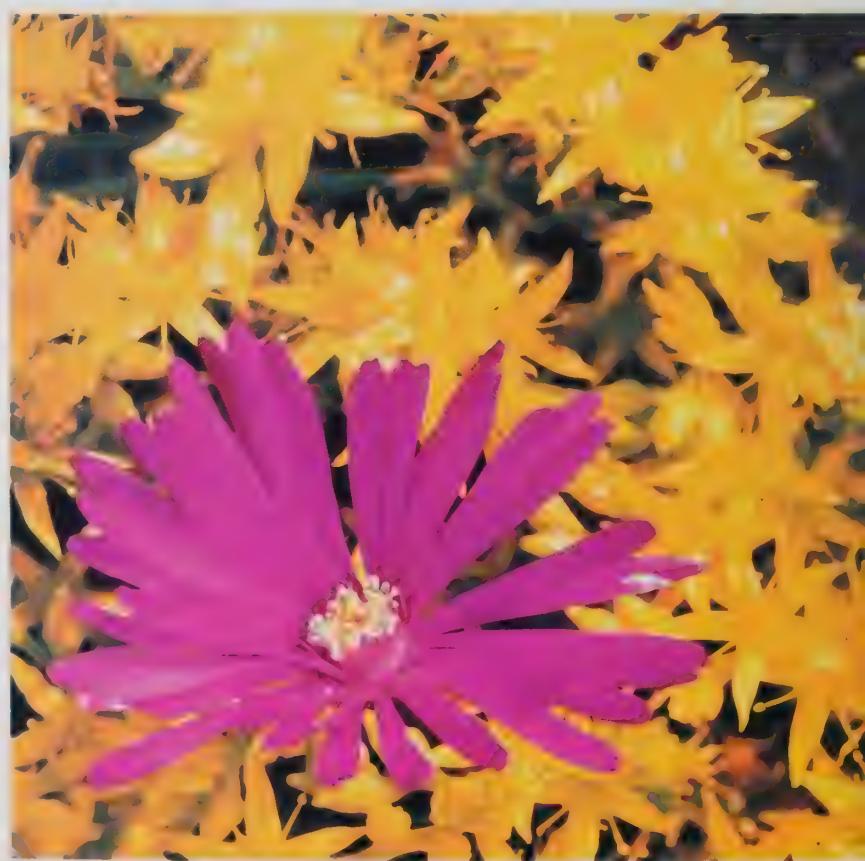
Approximately 34 percent of the total water used in Los Angeles is applied to outdoor landscaping. DWP's landscape water conservation programs promote efficient irrigation of existing landscapes and use of low-water-using plants.

Demonstration gardens at the DWP headquarters and other DWP-sponsored gardens and facilities display low-water-using plants and help to inform visitors that such gardens can be green, attractive, and a practical alternative to traditional landscaping.

The California Department of Water

Resources and the DWP sponsor free two-day master auditor training sessions to customers who own three acres of turf or more. Information from these training sessions has been incorporated into a guidebook of procedures and technologies to improve irrigation efficiency.

Other facets of the landscape program include advertising, brochures, a lawn watering guide direct mailing, the 10 percent large turf water reduction program, the annual spring garden expo, and a nursery program to promote the use of conservation plants.





**Drip irrigation systems save water by eliminating runoff and water lost through evaporation and overspray.**

### System Maintenance Measures

Since 1976, DWP's leak detection crews have surveyed over 3,000 miles of water pipe. More than 5,000 leak repairs have been made, with cumulative savings of approximately 1,000 acre-feet per year. Also, approximately 10,000 leaks have been detected on customers' property by the DWP and have been reported to those customers.

In 1984, DWP initiated a long-term program to replace over 1 million feet of existing water pipeline that is reaching the end of its useful life. In 1986, DWP initiated a small-main lining program for pipes 12 inches and smaller. By the end of 1990, approximately 208 miles of pipeline had been lined. The goal is to have all pipes lined by the year 2020. The replacement or repair of old water pipeline will reduce the frequency of leaks in the water distribution system and conserve water supplies.

To conserve water and minimize unaccountable water and lost revenues, the DWP started the meter replacement program in 1988. The final goal is to replace approximately 240,000 meters in the City. The DWP has also provided training and equipment to the Los Angeles Fire Department to enable the Fire Department to shut off sheared fire hydrants.

### Emergency Water Conservation Plan

On the recommendation of a Blue Ribbon Water Conservation Committee appointed by the mayor in 1977, the Los Angeles City Council approved an Emergency Water Conservation Plan that allows for quick imposition of mandatory water conservation measures in a drought or other emergency situation of reduced water supply.

This plan was amended in 1978 and 1990. In April 1988, Phase I of the Water Conservation Plan, which included prohibited uses of water, was implemented. Phase IA was implemented in July 1990 as a more effective version of the former Phase I. Phase IB was also implemented in July 1990. Other phases of the plan can be implemented depending on the severity of the water supply shortage and the degree of water use reduction required:

*Phase IA:* Prohibits the watering of lawns during the hotter periods of the day, the hosing of paved surfaces, allowing excess water to runoff onto sidewalks or into gutters, the operation of non-recycling decorative fountains, the service of water in restaurants except on request, and requires that leaks be repaired in a timely manner. The penalties for non-compliance are as follows: Violation 1 — warn-

The DWP  
"Drought  
Busters"  
canvass the city,  
distributing  
helpful  
literature and  
reminding  
violators about  
the City's  
Conservation  
Ordinance.

ing; 2 — \$50 surcharge; 3 — \$100 surcharge; 4 — \$150 surcharge; and 5 — restrictor or shut-off may be imposed.

All subsequent Phases include Phase IA.

*Phase IB:* Requires a 10 percent reduction in water use from base year 1986 with no monetary penalties.

*Phase 2:* Mandatory reduction remains 10 percent, monetary penalties for excess use over base allotment are as follows: Violation 1 — 15 percent surcharge plus \$3 per billing unit of excess use; 2 — 25 percent surcharge plus \$3 per billing unit of excess use; 3 or more — 75 percent surcharge plus \$4 per billing unit of excess use.

*Phase 3:* Increases mandatory reduction to 15 percent.

*Phase 4:* Increases mandatory reduction to 20 percent.

*Phase 5:* Increases mandatory reduction to 25 percent.

Users who do not reduce their historic use levels by the amounts specified in Phases 2 through 5 are subject to surcharges and other fines, to possible installation of flow restrictors in their service lines and, in extreme cases, to service disconnection. The Ordinance also includes an appeals process for those users who feel they would be unfairly burdened by a mandatory curtailment level.

The capability of the Ordinance to achieve significant reductions in water use was demonstrated during the 1976-77 drought. The public recognized the pres-

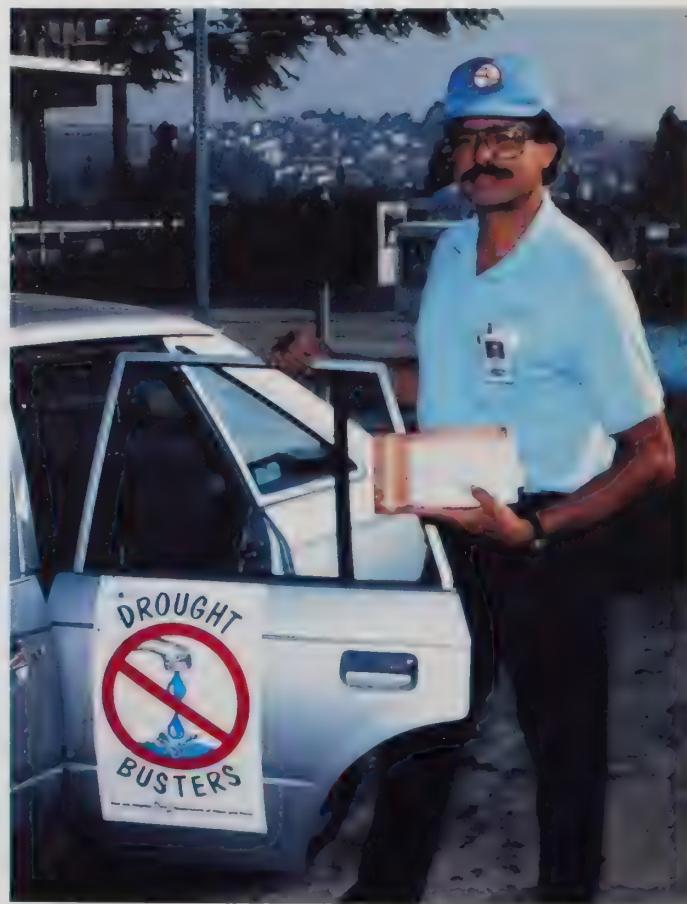
ence of a genuine emergency situation and responded accordingly.

This ordinance remains a valuable tool for Los Angeles in emergency situations. The Mayor and City Council can implement appropriate phases of the Ordinance during periods of water shortage to ensure adequate conservation of the available water supply.

#### Water Conservation Ordinance To Reduce Sewer Flows

This ordinance for the reduction of sewer flows requires the installation of water conserving devices by all DWP customers, man-

dates a 10 percent reduction in water use for all large turf customers and sets water conservation requirements for new construction. Failure to install water-saving devices in all but single family dwellings will result in a 10 to 100 percent surcharge on the water bill. The surcharge was 10 percent in July 1989, 25 percent in January 1990, 50 percent in July 1990 and 100 percent in January 1991.



## ADDITIONAL CONSERVATION MEASURES

Los Angeles will continue to implement new water conservation programs that are determined to be feasible and practical. Economic, environmental, social and technological factors were taken into consideration in evaluating possible additional programs. Planned future conservation programs are described below:

### Supportive Programs

*Educational Computer Software:* DWP will distribute new water awareness and conservation-oriented computer software for use in high schools. The software will focus on water resource management in California and will cover various aspects of water science and water conservation.

*Public Information Programs:* DWP will increase the funding given to water

conservation public information programs. In particular, DWP will emphasize advertising that focuses on single topics such as the repair of leaky toilets or faucets, or how to efficiently irrigate a lawn. The DWP will also conduct a water conservation poster contest and increase its distribution of literature and films.

### Residential Programs

#### *Ultra-Low-Flush (ULF)*

##### *Toilet Installation*

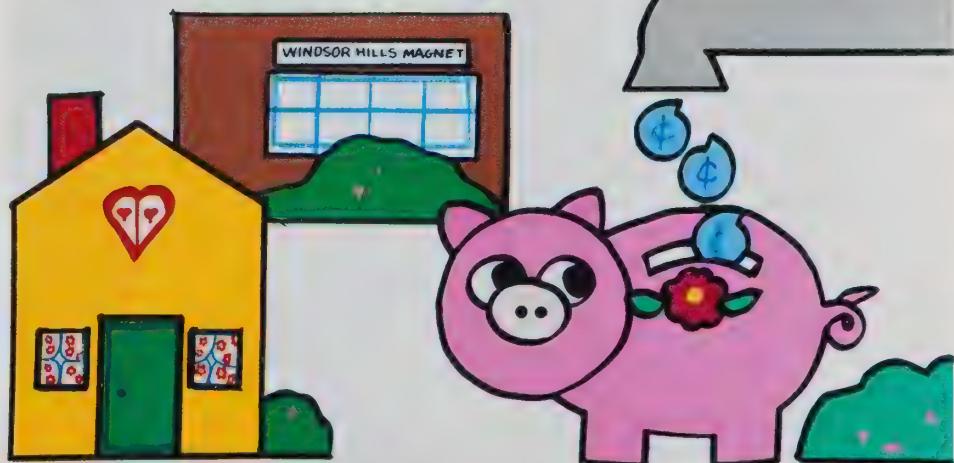
*Requirements:* ULF toilets using a maximum of 1.6 gallons per flush are required for new construction in the city. An ordinance could be passed to require existing non-ULF toilets to be replaced with ULF toilets on the sale or exchange of property.

##### *Separate Water Meters:*

Requiring separate water meters in all new construc-

Sponsoring poster contests and educational materials in the schools are a way of getting the conservation message to future DWP customers.

# SAVE WATER at HOME and SCHOOL





**Nearly 5,000 people attended DWP's 1991 Conservation and Garden Expo where they received helpful information on saving water and energy.**



tion would encourage conservation. Residents who conserve water would not be penalized because of those who share a meter with them and don't conserve. However, this would also increase the cost of new construction due to the installation of multiple services. Developers and City Council have opposed such an ordinance.

**Water-Efficient Appliance Legislation:** The sale of dishwashers and washing machines in Los Angeles could be limited to those

models that meet certain water-use efficiency standards. The City could adopt legislation or an ordinance that would require water use information for the sale of such appliances. DWP will work to achieve the adoption of a regulation of this type at the state or federal level, thereby avoiding duplication of effort and conflicting and contradictory standards.

### **Business and Industry Programs**

**Industrial Cooling Water Study:** A large amount of industrial water use is attributed to cooling water. During the recycling of the water in this process, much water is bled off or wasted. The DWP will study chemical and mechanical means to determine if the amount of waste in this process can be reduced in an effective manner.

**Large Industrial Incentive Program:** This proposed program of the DWP could pro-

vide financial incentives for large industries to conserve significant amounts of water in the form of reduced sewer surcharges or lower water costs. Industries could qualify by achieving a consistent percentage cutback in water use. This program could be eventually expanded to include all large customers.

**No Net Gain:** Developers who submit plans for City approval could be required to state how much water will be needed by the development. Under this DWP proposed program, Los Angeles would not allow any water consumption resulting from the new development, therefore, the developer would be required to implement water conservation measures elsewhere within the City until the water that will be used by the new development has been "replaced."

### **Landscape Programs**

**Water Efficient Designs:** The DWP could sponsor water-efficient designs and landscaping for new residential development model homes. The landscaping of these homes, properly advertised, helps promote the colorful and waterwise design of water-efficient landscaping.

**Turf Removal Incentive Program:** A rebate could be given to customers who replace existing turf with water-wise landscaping. DWP will monitor existing programs for their effectiveness to determine whether such a program should be implemented for Los Angeles.

*Local Utilization of Evapotranspiration Data:* Evapotranspiration (ET) is the amount of water that a plant transpires through the soil. Irrigators could use this information to determine exactly how much water should be supplied to their landscapes to make up for ET losses, thus saving potentially significant amounts of water. This type of program may prove to be more effective for large turf customers.

*CIMIS Stations:* The California Irrigation Management Information System (CIMIS), operated by DWP and MWD provides weather information and ET rates hourly. A program could be established to directly provide this information to large turf customers for more precise adjustments in their irrigation schedule.

*Nursery Program:* DWP will distribute landscape water conservation information through local nurseries, encouraging the efficient irrigation of existing landscapes and promoting the use of low-water-using plants.

*Additional Conservation Gardens:* DWP maintains low-water-using demonstration landscapes at its headquarters building and at the Mulholland Fountain near Griffith Park. DWP will continue to maintain its existing demonstration gardens through its programs to convert DWP facilities to low-water-using landscaping. These gardens will be designed to demonstrate that low-water-using plants can



be an attractive alternative to conventional landscaping. A long-range proposal calls for all DWP facility landscapes to be converted to xeriscape over a number of years, and suggests that these landscapes be promoted throughout the respective communities.

#### **System Maintenance/Management**

*Customer Leak Detection:* Leak detection by Water System personnel on customer property has been proposed as a possible water conservation program. DWP presently notifies customers when bills reflect the possibility of leaks on their property. Repairs are currently handled by the customer or by a private plumber hired by the customer. The cost-effectiveness of leak detection on customer property is

questionable at this time. However, in the meantime, the DWP will continue, through its existing leak detection program and public education campaigns, to encourage customers to find and repair leaks.

*Management of System Pressures:* The DWP could reduce water consumption and water system leakage by reducing water pressure available at customer meters. Reduced pressure will reduce the available flow through faucets and hoses and will reduce the amount of water forced through leaks. DWP could provide literature to customers on how to check water pressure and adjust reducers. The DWP could also allow customers to borrow pressure gauges and perform their

**DWP  
auditors  
help turf  
managers  
develop  
efficient  
irrigation  
practices.**

own adjustments, or the customers could hire a plumber to perform the adjustments.

*Management of Peak Demands:* Adequate treatment capacity, storage and distribution capacity is designed into the DWP distribution system to supply peak demands. Therefore, no deliberate peak demand reduction programs are necessary. DWP programs designed to reduce overall water use will also, as a side effect, reduce peak demands.

### Mandatory Water Use Restrictions

Mandatory water use restrictions have been proposed as a way of permanently reducing significant levels of water use in urban areas. For example, lawn-watering during midday hours and hosing of sidewalks and driveways are currently prohibited in Los Angeles. The implementation of Phase 2 of the Emergency Water Conservation Ordinance requires a 10 percent reduction by all customers, with economic penalties on all those who fail to comply. Public response to mandatory restrictions during emergency situations has been generally supportive. However, the imposition of mandatory measures during non-emergency periods has produced varied results in agencies where they have been implemented.

*Customer Percentage Curtailments:* If future frequent water shortages

become everyday occurrences, customer percentage curtailment on a frequent or permanent basis could be implemented to accomplish whatever level of water use reduction is necessary.

Customers could be required to reduce their historical use by a given percentage, with violators facing surcharges or other fines, or being otherwise penalized. Public involvement would be necessary to determine what the public would find acceptable regarding the frequency and type of Curtailment Program.

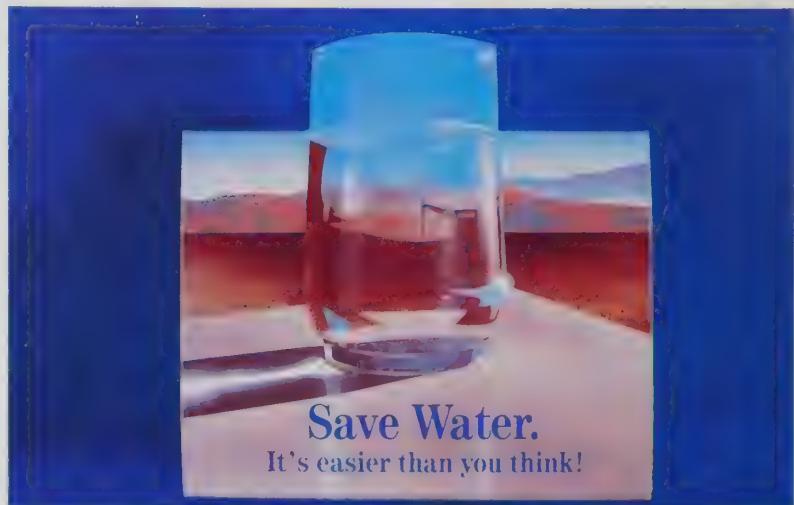
*Outdoor Water Restrictions:* Potential water conservation programs implementing outdoor water use restrictions include limiting watering to alternative days, prohibiting the hosing of hard surfaces or requiring that a hose not be left running while washing a car. In response to the fourth year of a drought, DWP has started a "Drought Busters" program. Through its public information, education and landscape infor-

mation campaigns, DWP promotes efficient outdoor water use. Mandatory outdoor water use restrictions are difficult to enforce and the use of such restrictions on a full-time basis reduces the "drought cushion" that these measures can provide in an acute shortage situation.

*Restaurant Water Service:* Water service in restaurants could be prohibited except on request, as is done in Phase IA of the Los Angeles Emergency Water Conservation Ordinance. This has been prohibited in Los Angeles since 1988.

*Restaurant Tent Card Contest:* DWP could sponsor a contest for school children and/or DWP employees to design an annual tent card display for restaurants. These displays will remind restaurant patrons that they will be served water only upon request. Prizes could include gift certificates to participating Los Angeles restaurants.

Tent cards in restaurants explain to customers why water is served only upon request.



## WATER RECLAMATION

**T**he development of water reclamation in Los Angeles is a tremendous challenge. Implementation of water reclamation projects in highly developed urban areas is constrained by physical and financial limitations and public and health concerns. However, reuse of reclaimed water for irrigation and industrial uses in Los Angeles may increase to approximately 32,800 acre-feet per year (AF/yr.) by the year 2010. The development of groundwater recharge projects is expected to result in the use of 20,000 AF/yr. of reclaimed water by the year 2010. Ultimately up to 45,000 AF/yr. may be used

for this purpose.

The DWP will implement groundwater recharge projects only if the water pumped from the groundwater basin and distributed to customers meets or exceeds all drinking water quality regulations.

DWP has been working with, and will continue to work with, the California Department of Health Services in the development of guidelines and regulations for the use of reclaimed water.

### Water Reclamation As An Alternative Source Of Supply

DWP is actively pursuing the development of

**The Tillman  
Reclamation  
Plant will  
provide  
reclaimed water  
for several  
planned projects.**



Reclaimed water is used to irrigate large turf areas such as golf courses.



reclaimed water projects which displace potable water use in Los Angeles to reduce purchases of MWD water and thus increase the water supply reliability. DWP is also cooperating with other agencies in developing additional reclaimed water projects. To encourage the use of reclaimed water, DWP is selling reclaimed water to its customers at a discount from the price of potable water. The policy of DWP is to support legislation which encourages water reuse while stressing public health protection.

#### DWP Reclamation Projects

Completion of irrigation, industrial and groundwater recharge projects would result in the use of up to 52,800 acre-feet of reclaimed water by DWP and its customers by the year 2010 to displace potable water for use elsewhere and supplement existing potable water supplies. An additional 15,000 acre-feet per year of reclaimed water may ultimately be used for groundwater recharge. The 35,000 acre-feet per year of reclaimed water used for the Sepulveda Recreation Lake

will not displace potable water use nor does it increase reliability.

#### Existing and Planned Irrigation Uses

*Los Angeles - Glendale Water Reclamation Plant:* Approximately 1,000 AF/yr. of reclaimed water from the Los Angeles/ Glendale Water Reclamation Plant is currently used to irrigate portions of Griffith Park and a seven-mile stretch of the Golden State Freeway right-of-way. Additional areas of Griffith Park will begin utilizing reclaimed water when

the Los Angeles Greenbelt Project is completed. The DWP will be participating with the City of Glendale in the installation of a reclaimed water pipeline from the LA/Glendale Plant to Forest Lawn, Glendale. The pipeline will include capacity to deliver reclaimed water to Elysian Park and Central Los Angeles.

*Donald C. Tillman Water Reclamation Plant:* Several projects are also planned to utilize the reclaimed water produced at the Tillman Plant. When completed, the Sepulveda Basin Project (Phases I and II) will deliver approximately 3,500 AF/yr. of reclaimed water for irrigation of the landscaped areas of the Sepulveda Basin Recreation Area. The project will be designed to allow for expansion of the reclaimed water delivery system to users outside of the Sepulveda Basin Recreation Area. DWP is currently performing environmental documentation and preliminary design activities for the East Valley Water Reclamation Project. This project will deliver reclaimed water from the Tillman Plant to the north and east San Fernando Valley. The project will include a trunkline with sufficient capacity to supply the Valley Generating Station, develop groundwater recharge in the East San Fernando Valley and supply 2,750 AF/yr. for irrigation demands in the Hansen Recreation Area.

*Terminal Island Treatment Plant:* The Terminal Island Treatment Plant produces an effluent with high concentrations of total dissolved solids and salts. This quality of water is not acceptable for irrigation or industrial uses. Additional treatment facilities are required to treat the sewage to an acceptable level for reuse. DWP recognizes the potential for reclamation projects irrigating greenbelt areas in the Harbor District such as Harbor Regional Park. Today these projects are considered to be "conceptual." Development of these projects may occur after the year 2010.

*Hyperion Treatment Plant:* The Hyperion Treatment Plant is presently being upgraded to provide secondary treatment of all of the sewage. The City of Los Angeles is working with the West Basin Municipal Water District on a proposal to add advanced treatment facilities for a portion of the Hyperion Plant effluent for reclamation purposes. The West Los Angeles Water Reclamation Project which will deliver reclaimed water to the West Los Angeles area is being considered as part of the West Basin Project. The initial estimate of the reclaimed water use by the West Los Angeles Water Reclamation Project is approximately 5,000 AF/yr.

*Irrigation Project Costs:* Unit costs for the larger scale irrigation projects adjacent to the reclamation plants, such

as the Sepulveda Basin Water Reclamation Project - Phase I, start at about \$325 per acre-foot which does not include the cost of treating the sewerage to produce the reclaimed water. Rebates from MWD, currently set at \$154 per acre-foot, encourage the development of reclamation projects. These rebates reduce the effective cost of the project and spread the burden of subsidy over the region since the benefits are region-wide.

### **Industrial Reuse**

*Los Angeles - Glendale Water Reclamation Plant:* Approximately 1,900 AF/yr. of the LA/Glendale Plant effluent may be utilized for industrial reuse in Los Angeles when the Elysian Park Project - Phase III, and the Eastside Industrial Project are completed by the year 2010.

*Donald C. Tillman Water Reclamation Plant:* The East Valley Water Reclamation Project will deliver approximately 2,000 AF/yr. of Tillman Plant effluent for industrial and irrigation reuse outside of the Sepulveda Recreation Basin. The majority of this demand will be industrial use as cooling water at Valley Generating Station.

*Terminal Island Treatment Plant:* The Unocal Refinery in the Harbor District is a potential industrial reuse customer which may result in 10,000 AF/yr. of the Terminal Island Plant effluent being utilized if addition-

al treatment facilities are constructed.

*Hyperion Treatment Plant:* The Hyperion Plant effluent is not suitable for industrial reuse at its present level of treatment. The City is working with the West Basin Municipal Water District on a large scale reclamation program which will provide additional treatment of Hyperion Plant effluent.

#### **Groundwater Recharge**

Ultimately, up to 45,000 AF/yr. may be used for groundwater recharge. Recognizing the need to advance the reclamation industry and the field of groundwater recharge in particular, the State of California Groundwater Recharge Committee was formed in 1988 under the guidance of the Interagency Water Reclamation Coordinating Committee. The DWP is an active member. Historically the California Department of Health Services (DHS) has taken a cautious approach to groundwater recharge with reclaimed water. The City of Los Angeles and the DWP participated in a \$1.6 million, four-year (1978-1982) epidemiological study on well water to provide information to DHS that could be used as a basis for developing statewide reclamation criteria for groundwater replenishment.

*Headworks Pilot Study:* In May 1990, DWP received the final of a series of permits required to begin the

Headworks Reclaimed Water Pilot Recharge Study. The study will divert approximately 700 AF/yr. of water from the Los Angeles River into the Headworks Spreading Grounds to recharge an isolated portion of the San Fernando Groundwater Basin. The Headworks Study will examine the quality of the water before spreading, and upon extraction, to demonstrate the feasibility of operating a full-scale recharge project at the Headworks Spreading Grounds, which could utilize up to 10,000 AF/yr. of reclaimed water.

*Full-Scale Recharge of the San Fernando Basin:* The East Valley Water Reclamation Project will include conveyance capacity to develop a full-scale groundwater recharge operation using the Tujunga, Hansen and Pacoima Spreading Grounds. The project will be designed in accordance with the guidelines and regulations as adopted by the Department of Health Services. Approval of a full-scale groundwater recharge operation in the North San Fernando Valley may result in up to 35,000 AF/yr. of reclaimed water being utilized. DWP will implement recharge projects gradually and only if the water pumped from the groundwater basin and distributed to customers meets or exceeds all drinking water quality regulations. It is assumed that 5,000 AF/yr. will be used for this purpose by the year 2000. By the year

2010, 20,000 AF/yr. of reclaimed water may be used in Los Angeles for recharge of the San Fernando Groundwater Basin and subsequent reuse as a potable water supply in accordance with the recently developed Draft Guidelines for Groundwater Recharge with Reclaimed Municipal Wastewater. Ultimately, up to 45,000 AF/yr. may be used.

*Recharge of the Coastal Basins:* Recharge of the coastal groundwater basins will be examined following development of the San Fernando Basin projects. The City is cooperating with the West Basin Municipal Water District in the development of the West Basin Seawater Barrier Project which will recharge that basin.

*Cost of Recharge Projects:* The cost of a groundwater recharge project utilizing reclaimed water is uncertain. The cost can vary significantly depending upon the treatment, dilution and water quality monitoring requirements placed upon the operation. The draft recharge guidelines require minimal levels of treatment and dilution of the reclaimed water. If native supplies of dilution water are insufficient to meet the requirement, then imported water supplies must be used to operate the recharge project.

*Other Potential Uses:* Uses of reclaimed water other than for irrigation or industrial purposes are regulated by the California



Administrative Code - Title 22 Reclamation Criteria. These potential uses include recreational impoundments, dual-plumbing of buildings, dual plumbing of residential tracts and public firefighting. The DWP will pursue other potential uses of reclaimed water as permitted under Title 22. In addition, DWP will continue to work with health, regulatory, political and special interest groups to develop new reclaimed water uses. The potential for

water reclamation in Los Angeles has also been evaluated independently in reports by the Interagency Task Force on Mono Lake (1979) and by the Orange and Los Angeles Counties water reuse study (1983). The potential for water reclamation is also being evaluated as part of the on-going State Water Resources Control Board's Bay/Delta proceedings.

**Water  
reclamation  
plants provide  
reclaimed water  
for industrial  
and irrigation  
uses.**

## ALTERNATIVE SOURCES OF SUPPLY AND MANAGEMENT MEASURES

To reduce its need for additional conventional water supplies, the DWP is constantly investigating alternative water supplies and management measures that may be available to the City. Los Angeles will continue to pursue the development of cost-effective alternatives and efficient measures.

### Desalination

The desalination of seawater is an energy-intensive and costly process and is not presently a feasible water supply for Los Angeles. Existing desalting operations are limited primarily to areas of the world where no other water supplies are available or where brackish groundwaters provide a less saline source water. The estimated cost of the desalinated water on Santa Catalina Island, a project in which Southern California Edison is involved, is \$5500 per acre-foot. Brackish groundwater, with salt concentrations of approximately 1,000 to 5,000 ppm, can be desalinated more economically than seawater. Unit costs of brackish groundwater desalination range from \$600 to \$1500 per acre-foot, depending on the salinity of the brackish water. This does not include the cost of pumping the groundwater to the surface. These processes compare unfavorably with the \$230 per acre-foot cost of additional conventional supplies available to the City from MWD.

### Local Runoff

Each year, a substantial amount of local runoff is conserved through facilities operated by the Los Angeles County Flood Control District (LACFCD), the U.S. Army Corps of Engineers and DWP. In years of very high runoff, existing facilities may be operated at maximum capacity, and any runoff beyond this maximum capacity amount is then lost to the ocean. The average amount of stormwater runoff entering the ocean through the Los Angeles River is approximately 40,000 AF/yr. A portion of this water could be conserved through construction of additional dams and spreading basins, or through rehabilitation of certain existing facilities. The LACFCD has studied a project to construct a new spreading basin in Dominguez Hills, along with facilities to divert stormwater from the lower Los Angeles River to the new spreading basin, which would conserve an estimated average of 6,000 AF/yr. of stormwater. However, LACFDC has found the project to be economically undesirable since unit costs are roughly \$500 per acre-foot or more.

### Groundwater Management

DWP operates the City's groundwater basins as large storage reservoirs, storing surplus water in wet years for use during dry years. This can reduce the need for additional surface storage



**Spreading grounds are used to help replenish the City's underground water supplies**

facilities. Extensive efforts are under way to protect this valuable supply from further chemical contamination and to remove contaminants that have entered the basins in past decades. DWP is also upgrading and enlarging its groundwater extraction and distribution capacity in the San Fernando Valley so that groundwater supplies can be better utilized during emergencies and periods of drought.

#### **Exchanges and Transfers**

An exchange or transfer of water between agencies may be beneficial if it results in a net water savings or cost savings. Exchange and transfer opportunities at the local level are fully developed. Regional exchange and transfer arrangements are in operation, and additional arrangements are being implemented by the Metropolitan Water District,

of which DWP is a member. MWD accomplishes a mass exchange and transfer of water throughout its service area, which includes Los Angeles. A specific example of transfer is LA-35T, a 900-foot-long pipeline that conveys about 350 cubic feet per second (cfs) of raw State Project water to the Los Angeles Aqueduct Filtration Plant. This transfer benefits the MWD by reducing peak demand for treated water, and increasing delivery of SWP water to the West Branch of the California Aqueduct, thereby reducing power consumption. The City of Los Angeles benefits through reduced costs by buying raw water, and increased reliability. A permanent replacement of LA35T is planned which will have a capacity of 700 cfs. This agreement between MWD and DWP was signed in June 1990. Construction is

anticipated to begin the fall of 1991 and the permanent pipeline should be in service in mid-1992.

#### **Pricing Policies**

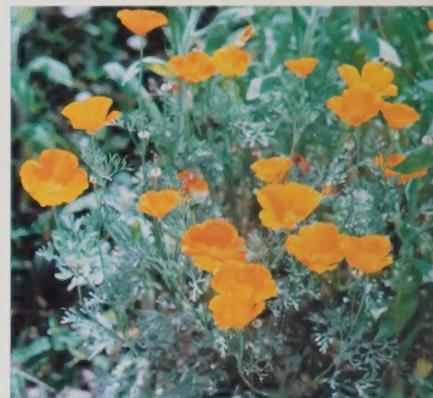
The goals of DWP's water pricing policy are: 1) water should be affordable, 2) rates should be designed to maximize the efficient allocation of resources, 3) rates should be forward looking, 4) rates should be relatively stable or at least predictable, 5) rates should be simple and understandable, and 6) rates should generate adequate revenue. The uniform block rates and seasonal pricing structure currently in effect in Los Angeles were implemented as a reasonable compromise to achieve these goals. Water pricing policies under consideration for Los Angeles include seasonal pricing, marginal cost pricing, increasing block rate structures, and demand charges. Pricing policies can be an effective demand management tool in conjunction with conservation programs. The basis for using pricing as a tool to manage demand is the principle that an increase in the price of water will lead to a decrease in demand. The effect of the current pricing policy on conservation is being evaluated along with the concept of increasing block rates. A consideration for any pricing policy is the requirement that revenue over the long-term equal costs. As a municipal agency, DWP can operate neither at a loss nor at a profit.

## CONCLUSION: PLANNED WATER MANAGEMENT IN LOS ANGELES

**T**his Plan presents the City of Los Angeles' 1990 outlook on population growth, water use and water supply availability through the year 2010. It outlines the City's program for managing future supplies in a manner which will eliminate waste.

Los Angeles will continue to provide adequate staffing and funding to maintain the effectiveness of existing conservation programs and to study and research additional conservation measures. In addition, the City will continue its historical commitment to pursue any water conservation or water management program that it determines to be feasible and cost-effective.

The conservation and management programs set forth in this plan will be reviewed annually by DWP staff and management. Annual public water conservation workshops will be held to assist in this ongoing review process.



**Demonstration gardens give customers an example of attractive conservation landscaping.**



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